



208892

Third Five-Year Review Report

for

Oakdale Disposal Sites

City of Oakdale

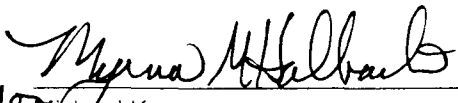
Washington County, Minnesota

May 2004

PREPARED BY:

Minnesota Pollution Control Agency
St. Paul, Minnesota

Approved by:


for Michael Kanner
Manager, Superfund Section
Minnesota Pollution Control Agency

Date:

26 APRIL 2004

Approved by:


Richard C. Karl
Acting Director, Region 5 Superfund Division
United States Environmental Protection Agency

Date:

5-4-04

[This page intentionally left blank.]

TABLE OF CONTENTS

List of Acronyms
Executive Summary
Five-year Review Summary Form

I. INTRODUCTION.....	1
II. SITE CHRONOLOGY	2
III. BACKGROUND	2
Physical Characteristics	2
Adjacent Land and Resource Use	2
History of Contamination.....	3
Initial Response.....	3
Site Investigation	3
Remedial Actions.....	4
Site Monitoring	6
Basis For Taking Action	6
IV. REMEDIAL ACTIONS	6
Remedy Selection	6
Remedy Implementation	7
System Operations and Maintenance	7
V. PROGRESS SINCE THE LAST REVIEW.....	8
VI. FIVE-YEAR REVIEW PROCESS.....	9
Administrative Components.....	9
Community Involvement.....	9
Document Review.....	10
ARAR Review	10
Data Review.....	12
Site Visit	13
Interviews.....	13
VII. TECHNICAL ASSESSMENT	14
VIII. ISSUES	15
IX. RECOMMENDATIONS.....	15
X. PROTECTIVENESS STATEMENT.....	16
XI. NEXT REVIEW	16

APPENDIX A - FIGURES

Figure 1 - Site Location
Figure 2 - Site Map
Figure 3 - Monitoring Well and Pump-Out Well Locations
Figure 4 - Elevation Comparison – Piezometers and Monitoring Wells
Figure 5 - Surficial Aquifer Contours

APPENDIX B - TABLES

Table 1 - Pump-Out Well Operating Data
Table 2 - Ground Water Analytical Data – Monitoring Wells

APPENDIX C - BIBLIOGRAPHY

List of Acronyms

ACLs	Alternate Concentration Levels
AMR	Annual Monitoring Report
AOC	Administrative Order of Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
COC	Chemical of Concern
EPA	United States Environmental Protection Agency
HBV	Health Based Value
HRL	Health Risk Level
IC	Institutional Control
IPE	Isopropyl Ether
MCES	Metropolitan Council Environmental Services
MCLs	Maximum Contaminant Levels
MDH	Minnesota Department of Health
MERLA	Minnesota Environmental Liability and Response Act
MPCA	Minnesota Pollution Control Agency
NCP	Nation Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PLP	Permanent List of Priorities
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
RA	Remedial Action
RAGS	Risk Assessment Guidance for Superfund
RAL	Recommended Allowable Limit
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
TBCs	To Be Considereds
VOCs	Volatile Organic Compounds
WasteLan	The Regional database related to CERCLIS

Executive Summary

The remedy for the Oakdale Disposal Sites located in Oakdale, Minnesota included the identification and removal of buried wastes and contaminated soil, the proper abandonment of multi-aquifer wells, the construction and operation of a ground water containment system, and establishment of a long-term ground water monitoring network. The trigger for this five-year review was the EPA approval date for the previous five-year review.

The identification and removal of buried wastes and contaminated soil was completed in 1983 and 1984. *Thirty-nine privately owned wells were abandoned during 1984.* The ground water containment system was placed into operation during August 1985 and continues to the present. The ground water containment remedy is removing VOCs from the unconfined aquifer located in the glacial drift and is controlling plume migration both laterally and vertically. The remedy is functioning as intended and is protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name <i>(from WasteLAN)</i> : Oakdale Disposal Sites		
EPA ID <i>(from WasteLAN)</i> : MND980609515		
Region: 5	State: MN	City/County: City of Oakdale/Washington County
SITE STATUS		
NPL status: Final		
Remediation status <i>(choose all that apply)</i> : Operating		
Multiple OUs? No	Construction completion date: August 1985	
Has site been put into reuse? NO		
REVIEW STATUS		
Lead agency: State - MPCA		
Author name: Mark Rys		
Author title: Project Manager	Author affiliation: MN Pollution Control Agency	
Review period:** 12 / 23 / 2003 to 5 / 18 / 2004		
Date(s) of site inspection: 2 / 6 / 2004		
Type of review: Pre-SARA		
Review number: Third (3)		
Triggering action: Previous Five-Year Review Report		
Triggering action date <i>(from WasteLAN)</i> : May 18, 1999		
Due date <i>(five years after triggering action date)</i> : May 18, 2004		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

The institutional controls are not in place. Minnesota Mining and Manufacturing (3M) Corporation has submitted a draft restrictive covenant to the MPCA for review. The institutional controls will be recorded with Washington County once they are approved by the MPCA.

Recommendations and Follow-up Actions:

The ground water containment remedy is removing VOCs from the glacial drift aquifer. It is recommended that the ground water remedy continue.

Protectiveness Statement(s):

The ground water containment remedy is controlling plume migration both laterally and vertically. The remedy is functioning as intended and is protective of human health and the environment in the short term. Long term protectiveness will be ensured once the institutional controls are in place.

Other Comments:

None

FIVE-YEAR REVIEW REPORT

Oakdale Disposal Sites Oakdale, Minnesota

I. INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at the Oakdale Disposal Sites is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERLA Section 121 and the National Contingency Plan (NCP). CERLA Section 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to ensure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such actions.

The Agency interpreted this requirement further in the NCP; 40 CFR Section 300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

The Minnesota Pollution Control Agency (MPCA) staff has completed a Five-Year Review of the Remedial Actions (RAs) conducted at the Oakdale Disposal Sites in Oakdale, Minnesota by the Minnesota Mining and Manufacturing (3M) Corporation. This Five-Year Review evaluates whether the RA remains protective of public health, welfare, and the environment and was conducted from December 2003 through May 2004.

This review focuses on the protectiveness of the Oakdale Disposal Sites RA nineteen years from the time the RA commenced. This is the second Five-Year Review completed by the MPCA. The first Five-Year Review was completed by EPA on March 31, 1993

and the second was completed by MPCA. EPA concurred on the second Five-Year Review in a letter received by MPCA on May 18, 1999.

II. SITE CHRONOLOGY

Chronology of Site Events

Date	Event
1980	Investigation performed by MPCA.
11/14/1980	MPCA sent a letter to potential responsible parties.
7/26/1983	Administrative Order by Consent (AOC) and Response Order by Consent (Consent Order) signed by Minnesota Mining and Manufacturing (3M) and the MPCA.
9/08/1983	Site was placed on the National Priorities List (NPL).
1983 - 1984	Removal of buried wastes and contaminated soil.
1984	Abandonment of 39 privately owned wells.
8/1985	Initiation of ground water containment and monitoring.
1985 - Present	Ongoing operation, maintenance and monitoring of the ground water remedy.
3/31/1993	Completion of the first Five-Year Review by EPA.
5/18/1999	Receipt of the EPA approval letter for the second Five-Year Review which was completed by the MPCA on March 27, 1998.
1/24/2003	MPCA approved the updated Quality Assurance Project Plan (QAPP) with comments and modifications.

III. BACKGROUND

Physical Characteristics

The Oakdale Disposal Sites consists of three separate sites, which are located west of Hadley Avenue and north and south of Highway 5 (old Highway 212) in the city of Oakdale, Minnesota (Figure 1). The Sites are referred to as the Brockman, Abresch, and Eberle sites, named after the property owners at the time the sites were used (Figure 2).

The Abresch site is the largest of the three sites (approximately 27 acres) and is located along both the north and south sides of Highway 5. The Abresch site included a wetland with surface ponds and a stream leaving the site. Some areas of the site remain as wetlands. The Brockman site is located immediately southwest of the Abresch site. The Eberle site is located to the north of the Abresch site.

Adjacent Land and Resource Use

Adjacent land use consists of mixed residential, commercial and light industrial.

History of Contamination

The three properties, the Abresch, Brockman and Eberle sites, were used for the disposal of industrial waste. The Abresch site was used as a waste burial and drum reclamation site from the mid-1940s until 1961. Waste disposed at the site included scrap materials (tape and paper), plastics, resins, and solvents in drums and smaller containers. Trenches were excavated to facilitate burial of containers and scrap materials. During the construction of Highway 212 (now Highway 5), uncovered drums and scrap materials were deposited on the side of the road. Waste disposal methods used at the Brockman site were comparable to those utilized at the Abresch site. The Eberle site was used for open burning of combustible materials. Waste was spilled onto the ground and ignited.

The sites were investigated in 1980 by the MPCA. Analysis of on-site waste indicated that a variety of hazardous substances, particularly volatile organic compounds (VOCs), were disposed of in the trenches utilized at the Abresch and Brockman sites. In addition, soil sampling at the Eberle site revealed heavy metals contamination. The MPCA sampled 45 nearby residential and municipal wells to ascertain whether the sites were affecting potable water supplies. The results indicated that nine relatively shallow residential wells were contaminated with hazardous substances, with the major contaminant being isopropyl ether.

On November 14, 1980, the MPCA sent letters to parties identified as possible generators of waste disposed of at the sites. 3M voluntarily proposed to finance a hydrogeologic study of the sites.

Initial Response

Site Investigation

3M's consultant performed a hydrogeologic study of the sites (Barr Engineering, March 1982, April 1983) which indicated that contaminants were confined to the glacial drift in and near the sites and in the Platteville aquifer, a shallow fractured limestone formation beneath the glacial drift. A vertical downward gradient combined with the absence of the Decorah Shale aquitard under part of the sites, provided a pathway for contaminant migration from the glacial drift to the Platteville Limestone. In addition, a narrow northeast-southwest fracture system in the limestone was identified as the most likely pathway for migration of contaminants once they reached the Platteville Limestone. The deeper aquifers, the St. Peter and Jordan Sandstone formations, are protected by a layer of Glenwood Shale that underlies the three disposal sites. Multi-aquifer wells adjacent to and southwest of the Abresch and Brockman sites posed a threat of migration of VOCs from the Platteville Limestone to the underlying St. Peter Sandstone.

The highest concentrations of VOCs were detected in the glacial drift and the Platteville Limestone beneath and immediately southwest of the Abresch site. The contaminants detected at the highest concentrations included isopropyl alcohol, isopropyl ether, methyl ethyl ketone, acetone, 2-butyl alcohol, methyl isobutyl ketone, toluene, 4-methyl-2-pentanol

and xylenes. Isopropyl ether (IPE) was the most mobile compound in the ground water, migrating from beneath the site to the southwest in a narrow plume along the limestone fracture zone. IPE was detected in one monitoring well completed in the St. Peter Sandstone southwest of the Abresch site. It was believed that contaminants were reaching the St. Peter Sandstone through multi-aquifer wells which had open boreholes across the Platteville Limestone and the St. Peter Sandstone. The shallow drift aquifer under both the Brockman and Eberle sites contained significantly lower levels of organic compounds.

IPE and other VOCs were detected in surface waters within the Abresch site and in an unnamed stream as it leaves the site. The various ponds and wetlands in and bordering the Abresch site are local discharge zones for the water table during most times of the year. Data collected from other ponds and wetlands surrounding the sites indicated that the sites had not affected surface water quality outside the limits of the Abresch site.

A geophysical survey of the sites was conducted (Technos, September 1982). A magnetometer survey delineated trenches where waste had been buried at both the Abresch and Brockman sites. Test excavations showed that buried waste in trenches consisted of 55-gallon drums, 5-gallon pails, dry scrap, and several plastic liner bags containing waste. The majority of containers in the trenches were intact and the wastes did not appear to be migrating beyond the disposal trenches. Additional excavations revealed that areas adjacent to the disposal trenches contained significant amounts of dry scrap. The few metal drums or pails encountered outside the disposal trenches were badly damaged and empty. Buried waste was not discovered at the Eberle site.

The result of this investigation was the delineation of two significant classes of buried materials at the Abresch and Brockman sites. Class I areas consisted of concentrated steel drums and other containers in trenches. Class II areas were identified as locations where steel drums and containers were more dispersed and intermixed with other waste scrap.

Soil sampling and analysis indicated the presence of elevated levels of heavy metals (antimony, copper, zinc and selenium) in soils at the Eberle site. VOCs, zinc and polychlorinated biphenyl (PCB) contamination were discovered in soils from the Abresch and Brockman sites (Barr 1982).

A well survey identified over 1,000 privately-owned wells within the well survey study area, with 44 privately-owned wells within the plume of ground water contamination.

Remedial Actions

A surface removal of deteriorating 55-gallon drums and 5-gallon pails containing residual materials was conducted by 3M at the Abresch and Brockman sites in early 1982. The wastes removed from the sites were disposed of at the 3M Chemolite incinerator in Cottage Grove, Minnesota.

In accordance with the Consent Order, and as determined by the results of the geophysical survey and test excavations, the materials and contaminated soil in the disposal areas designated as Class I were removed. For the Class II areas, only those areas that contained individual or groups of drums were excavated. Prior to the removal action, the entire Abresch site was fenced by 3M to restrict access to the site.

Waste excavation and disposal activities were performed in 1983 and 1984. A total of 11,500 cubic yards of bulk solids (waste material, container carcasses and associated soil), 4,200 empty drums, and 8,700 empty five-gallon pails were removed. Although the excavated containers included in these totals were not intact, they may have contained some waste materials and/or contaminated soils. In addition, approximately 4,660 cubic yards of contaminated soil were excavated. Fifteen intact containers were excavated and overpacked. The largest volume of excavated materials (11,800 tons) was transported to the 3M Chemolite incinerator for disposal in accordance with the terms of the Consent Order. An additional 6,500 tons of excavated waste, found to contain more than 50 parts per million (ppm) of PCBs, was transported to a hazardous waste landfill for disposal. Excavated soil with low levels of contamination were treated on-site at construction aeration pads.

Approximately 173,000 gallons of contaminated water was collected during the removal activities and transported to the 3M Chemolite facility for processing in the facility's wastewater treatment system.

The highest ground water contaminant concentrations were detected in monitoring wells in the northern half of the Abresch site. Eleven shallow ground water containment wells were installed at the northern half of the Abresch site and one in the "isthmus area" in the southern portion of the site. The containment wells were screened across the surficial aquifer, i.e., generally from the water table to the top of the till.

Extracted ground water is pumped to a vented holding tank which is located in a control building. The contaminated water subsequently discharges to an on-site sanitary sewer and eventually flows to the Metropolitan Wastewater Treatment Facility, which is a publicly owned treatment works (POTW). The discharge is regulated by the Metropolitan Council Environmental Services (MCES), formerly the Metropolitan Waste Control Commission. The discharge permit was granted by MCES with the requirement that an artificial ventilation system be placed downstream of the discharge point. The holding tank provides an air break between the containment wells and the sewer, equalizes the rate of discharge to the sewer, and provides a location for venting solvent vapor. The atmosphere at the discharge point and at the downstream location is monitored, and must remain below 10 percent of the lower explosive limit (LEL). The contaminated water discharge is monitored for parameters established by MCES in the permit.

Of the 44 privately-owned wells identified within the ground water plume, 39 were abandoned in 1984, three contaminated wells were added to the monitoring well network,

and the two remaining wells were found to be single-aquifer wells that obtain water from an unaffected aquifer. Well abandonment procedures generally involved removal of the well riser pipe and pump and pressure grouting the well in accordance with the Minnesota Department of Health (MDH) Water Well Construction Code. Three residences and one business were provided with city water prior to well abandonment.

Site Monitoring

A ground water monitoring program was established to assess the effectiveness of the previous RAs, to detect any future contamination migration, and to assess the need for modifications to the ground water containment system. The monitoring well network consists of the containment wells, select monitoring wells and select private wells. Three groups of wells comprise the monitoring well network. They are the Brockman site wells, which monitor the effectiveness of the waste excavation program at that site; the Abresch site wells, which monitor the effectiveness of both the waste excavation and the ground water containment system; and bedrock wells, designed to monitor the status of the IPE plume and the effectiveness of the program which sealed the multi-aquifer wells. Figure 3 shows the location of the current monitoring and containment wells.

Basis For Taking Action

Hazardous substances were present in drums and containers and hazardous substances were detected in soil and ground water. The hazardous substances include:

Ground Water

Isopropyl ether
Acetone
Isopropyl alcohol
Methyl ethyl ketone
Methyl isobutyl ketone
Toluene
2-butyl alcohol
4-methyl-2-pentanol
Benzene
Xylenes

Soil

Isopropyl ether
Acetone
Polychlorinated biphenyl (PCB)
Heavy metals

IV. REMEDIAL ACTIONS

Remedy Selection

The Administrative Order by Consent (AOC) and the Response Order by Consent (Consent Order), signed July 26, 1983, stated that "3M, by and through its contractors, shall implement the program designed to protect the public health, welfare and the environment from threatened or actual release of hazardous substances associated with the Oakdale disposal sites, which program is set forth in Exhibit A to this Consent Order

and is entitled Remedial Action Plan (RAP).” The purpose of the RAP was to: “further define the extent and location of wastes on the Oakdale disposal sites; to delineate procedures for implementing the selective removal of waste; to develop disposal options; to carry out a monitoring program while work is underway; to implement a system to control contaminated ground water; and to define a long-term monitoring system to ascertain if all contaminants have been removed or confined to the site.” The delineation and removal of the waste and contaminated soil occurred many years ago. The remaining remedy consists of ground water pumping for the purpose of plume control in order to prevent further migration of contaminants in the aquifer. Long term monitoring is being implemented to verify the effectiveness of the containment system.

Remedy Implementation

The July 26, 1983 AOC and Consent Order documented the RA for the Oakdale Disposal Site. The RA included the identification and removal of buried wastes and contaminated soil, the proper abandonment of multi-aquifer wells, the construction and operation of a ground water pump and containment system, and establishment of a long-term ground water monitoring network.

The identification and removal of buried wastes and contaminated soil was completed in 1983 and 1984. Thirty-nine privately owned wells were abandoned during 1984. The ground water extraction system was constructed in 1985 and was placed into operation during August 1985. The ground water containment system, which originally consisted of twelve extraction wells (PW1 through PW12), was installed to manage contaminated ground water from the shallow aquifer in the glacial drift. Extraction well PW12 was abandoned in 1999. The ground water pumped from the eleven remaining containment wells is discharged into the sanitary sewer for treatment at the Metropolitan Wastewater Treatment Facility, a POTW under an MCES permit. 3M has maintained, operated and monitored the ground water containment system from August 1985 through the present.

System Operations and Maintenance

3M is performing ongoing operation, maintenance and monitoring for the ground water containment system. The primary activities include the following:

- Periodic operational and equipment inspections and maintenance;
- Monitor the discharge sump exhaust for the lower explosive limits three times a month;
- Monthly well chlorination and volumetric flow measurements at each containment well;
- Quarterly sampling of the discharge from containment wells to the sanitary sewer per the requirements of the discharge permit;
- Semi-annual sampling and analysis of water samples collected from the containment wells;
- Semi-annual water level measurements at select monitoring wells;

- Sampling and analysis of water samples collected from the remaining wells included in the monitoring network on a semi-annual, annual or biennial basis as approved by the MPCA;
- Routine maintenance, including chemical treatment and redevelopment as required by site specific conditions; and
- Submittal of an annual ground water monitoring report to the MPCA.

The operation and maintenance costs were requested from Mr. Todd Fasking, Senior Environmental Engineer with 3M. Mr. Fasking indicated they were not available.

V. PROGRESS SINCE THE LAST REVIEW

The last Five-Year Review, completed in 1999, contained several recommendations that are summarized as follows:

- Continue the ground water containment and monitoring program at its current level of production in order to maintain protection of human health and the environment.
- Obtain ground water elevations and analyses from all wells and complete a ground water plume map.
- If ground water contaminant concentrations should increase dramatically, complete further investigations to ascertain if source areas remain on site with residual contamination high enough to influence ground water.

Ground water containment and monitoring continues at the eleven remaining containment wells with discharge to the sanitary sewer. Containment well PW12 was abandoned on December 22, 1999 due to low ground water recharge and VOC recovery. Brockman site wells 45 and 4001 and private well W59 were also abandoned on December 22, 1999. Platteville wells W5103, W5104 and W5105 were abandoned in 2001. Private well W73 is no longer included in the monitoring network, but the well owner will not allow 3M to abandon the well. Monitoring continues at the remaining wells based on the monitoring plan approved by the MPCA.

Ground water contour maps and iso-concentration maps have been submitted in various transmittals, including the 2002 annual monitoring report (AMR).

The previous five-year review recommended that potential sources of contamination may need to be investigated if the ground water contaminant concentrations should increase as documented from 1988 to 1993 at PW3. The contaminant concentrations have been stable to decreasing at the wells since completion of the last five-year review; therefore, the MPCA did not request additional assessment to ascertain if source areas remain that may be influencing ground water quality.

3M decided to be proactive and perform additional assessment in an attempt to determine if additional source areas were present. The intent was to determine if additional source

area removal was warranted to enhance the efficiency of the pump and monitor timeframe. A passive soil gas survey was performed during October 2000 at select locations on the Abresch site to evaluate potential source areas for VOCs detected in the ground water. A second soil gas survey was completed in July 2001 based on the findings of the 2000 soil gas survey. The iso-concentration maps presented in the reports suggested that contamination may exist beyond the northwestern boundary. Upon further review of the data, it was determined the open iso-concentration lines illustrated along the north and west portions of the site were associated with limitations of the software and were not the result of off-site contamination. Therefore, the MPCA stated in a July 2, 2002 letter that "additional work will not be needed to re-evaluate the nature and extent of soil contamination at the Oakdale Disposal Site at this time."

On May 14, 2001, MDH established an HBV of 80 micrograms per liter (ug/l) for isopropyl ether. This HBV has been used as a performance standard to evaluate the effectiveness of the ground water containment system to control plume migration and stability.

On January 24, 2003, the MPCA approved the updated QAPP with some comments and modifications. Effective with the 2003 monitoring, the updated QAPP and letter modifications will be followed for data collection, analyses, review and management activities associated with this project.

VI. FIVE-YEAR REVIEW PROCESS

Administrative Components

The Five-Year Review was initiated on December 23, 2003. The 3M representative was notified of the initiation of the Five-Year Review during January 2004. The review components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

Community Involvement

On February 11, 2004, a notice was published in the Oakdale-Lake Elmo Review, a local newspaper, announcing that a Five-Year Review was being conducted for the Oakdale Disposal Sites located in Oakdale, Minnesota.

Representatives of 3M, MCES and the city of Oakdale were notified by a telephone interview that a five-year review was being performed. None of the contacted parties expressed a concern regarding the status and protectiveness of the remedy.

Document Review

This Five-Year Review included a review of relevant documents including the Consent Order, additional assessment reports, the AMRs for 1997 through 2002, MPCA staff response letters and the previous Five-Year Review reports. A list of the reviewed documents is presented in the Bibliography (Appendix C).

ARAR Review

The Five-Year Review is being conducted to determine whether the Oakdale Disposal Site RA remains protective of public health and the environment. Five-Year Review guidance established policy for EPA to review and analyze the RA at a site as it is affected by newly promulgated or modified federal and state environmental laws. ARARs associated with the construction and long-term maintenance and monitoring of the RA at the Oakdale Disposal Site were not addressed in the Consent Order. However, the Consent Order mandates that 3M “shall implement the program [RAP] to protect the public health, welfare and the environment from the threatened or actual release of hazardous substances associated with the Oakdale Disposal Sites...”. The RA must meet the applicable or relevant and appropriate federal and state requirements.

ARARs for the selected remedy are listed below.

Safe Drinking Water Act (SDWA) (40 CFR Parts 141 - 146)

Establishes federal maximum contaminant levels (MCLs) for contaminants in public drinking water supplies.

This ARAR applies to any aquifer which could be used for a public water supply. The shallow aquifers are hydrologically connected to deeper bedrock aquifers which are used for public water supplies.

Minnesota Rules Chapter 4725. Water Well Code.

Establishes standards for the construction, maintenance and sealing of wells.

This ARAR continues to apply even though the wells were previously constructed, because it governs the maintenance and sealing of wells.

Clean Water Act, 40 CFR 403. Regulates Discharge to POTW.

This ARAR applies because contaminated ground water is pumped into the MCES sewer system and the water is treated in a POTW as required by a National Pollutant Discharge Elimination System (NPDES) permit issued to the MCES.

Contaminated ground water is extracted by pumping and is discharged to the sanitary sewer for treatment at the POTW. This activity is regulated by Section 307 (b) of the Clean Water Act (40 CFR 403). POTWs are required to develop and enforce pretreatment standards to prevent interference with operation. These requirements are applicable to the RA for ground water being discharged to the POTW. MCES has established site discharge limits for total VOCs and other parameters, which are monitored and reported to MCES.

Minnesota Rules Chapter 7060

Establishes uses and the nondegradation goal for ground water and provides direction on when and how contaminated ground water must be managed.

Minnesota Statute 103 H. Ground Water Protection Act.

Establishes health risk limits (HRLs) for ground water contaminants through which nondegradation and plume containment will be evaluated.

Minnesota Rules Part 4717.7100 to 4717.7800. Establishes Health Risk Limits.

A HRL is a concentration of ground water contaminant or mixture of ground water contaminants that can safely be consumed daily for a lifetime. A HRL is expressed as a concentration in parts per billion or calculated as a “hazard index.

A health based value, or HBV, is the concentration of a ground water contaminant, or a mixture of contaminants, that poses little or no risk to health, even if consumed daily over a lifetime. MDH develops HBVs in response to requests from other Minnesota agencies that have detected a contaminant in Minnesota ground water. Health based values are similar to HRLs for ground water, with one significant exception: HRLs have been promulgated as rules and HBVs have not. In a July 14, 2001 memo, MDH established an HBV of 80 ug/l for isopropyl ether.

There were no clean-up standards promulgated in the Consent Order. However, the MCLs, HRLs and HBVs have been used as performance standards to evaluate the effectiveness of the ground water containment system to control plume migration and stability.

Data Review

The ground water containment system currently consists of 11 containment wells, PW1 through PW11, which are located on the Abresch site (Figure 3). These wells are all screened in the glacial drift, although some are screened in the upper alluvium and some in the basal alluvium. Well PW12 was abandoned on December 22, 1999 due to low ground water recharge and VOC recovery.

Ground water containment has been ongoing since August 1985. The 2002 AMR indicates that over 24 million gallons of water, containing 850 gallons of VOCs, was pumped from the extraction wells and discharged to the sanitary sewer during 2002. The 2002 AMR further states that over 340 million gallons of water, containing 36,100 gallons of VOCs, have been pumped since system start-up in 1985.

Ground water extraction, ground water quality, and VOC recovery data for the containment wells is summarized in Table 1 for the years 2001 and 2002. The data shows that containment well PW3 has the highest total VOC concentration and containment wells PW2, PW3 and PW4 are responsible for over 85% of the cumulative VOC mass removed in 2001 and 2002. Perimeter containment wells PW5, PW9 and PW10 produce low volumes of water and have significantly lower VOC removal rates. The total VOC concentration at the 11 containment wells has fluctuated over the last five years, but has decreased compared to historical concentrations. Multiple VOCs have been detected in the containment wells, although the VOCs detected most frequently and at the highest concentrations generally include 2-butyl-alcohol, acetone, isopropyl alcohol, isopropyl ether, methyl isobutyl ketone, and methyl ethyl ketone.

Thirty-nine (39) wells comprised the ground water monitoring network in 2002. This includes wells completed in the glacial drift, in the Platteville Limestone and in the St. Peter Sandstone. In 2002, the containment system effectively maintained the ground water elevations in the surficial aquifer at levels lower than the elevations in the underlying Platteville Limestone (Figure 4). The lower ground water elevations in the surficial aquifer compared with the elevations in the Platteville Limestone verify that an upward gradient exists near the containment wells. The ground water elevations in the wells in the surficial aquifer also indicate the presence of a capture zone around the containment wells (Figure 5). A review of the ground water elevation data indicates the ground water containment system has maintained both lateral and vertical hydraulic control.

Ground water samples are collected from the monitoring wells for laboratory analysis based on a variable monitoring schedule as approved by the MPCA. The ground water analytical data presented in Table 2 is segregated based on the aquifer (wells completed in the upper and basal alluvium of the surficial aquifer, the Platteville Limestone and the St. Peter Sandstone) and the location of the wells (north of Highway 5, main containment area, etc.).

The data shows the highest total VOC and IPE concentrations are generally detected in the wells screened in the upper alluvium located to the north of the containment wells (W20 and W22), in the vicinity of the containment wells (W29, W32 and W36) and to the southeast (W33) in the vicinity of containment well PW10. The total VOC and IPE concentrations in the wells screened in the upper alluvium decrease with increasing distance from the areas with the containment wells, as indicated by the data from W25, W28, W31 and W35.

The total VOC and IPE concentrations detected in the basal alluvium wells are generally similar or lower than the concentrations detected in the adjacent upper alluvium wells (W2007/W20 and W22, W2008/W31, W2009/W33 and W2012/W36). The total VOC and IPE concentrations detected in the basal alluvium wells continue to decrease as compared to the historical concentrations. Isopropyl ether is the predominant contaminant detected in the basal alluvium wells.

Earlier investigations indicate that IPE is the most mobile VOC in the ground water beneath the Abresch site and have documented downward migration of IPE into the Platteville Limestone. Once in the Platteville Limestone, the IPE migrated to the southwest and northeast along preferential flow paths in the limestone. The data from 2002 indicates continued improvement in the IPE concentration in the wells completed in the Platteville Limestone. For the November 2002 samples, the IPE concentration was less than the reporting limit in 6 of the 10 wells completed in the Platteville Limestone. Only well W3, which is located on the Abresch site, contained an IPE concentration above the 80 ug/l HBV.

The one monitoring well (W6201) completed in the St. Peter Sandstone is located southwest of the Abresch site. Isopropyl ether was the primary VOC detected in the samples from the well. The IPE concentration has steadily declined since 1996 and IPE was not detected (<5 ug/l) in the November 2002 sample.

The ground water elevations and ground water quality data indicates the containment system is maintaining gradient control and has resulted in a stable to decreasing contaminant plume.

Site Visit

Site visits have been conducted periodically throughout the review period; however, a site visit was conducted on February 6, 2004 as part of the Five-Year Review process. The monitoring wells and recovery wells referenced in this document are in place and operational.

Interviews

An interview was conducted on February 10, 2004 with Ms. Tina Nelson, Engineer with MCES, regarding the discharge to the POTW. Ms. Nelson indicated the discharge from

the Oakdale Disposal Sites is meeting the requirements of the permit. She indicated the current discharge permit is effective through January 31, 2005.

Mr. Chris Sonterre, Utility Supervisor for the city of Oakdale, was interviewed on February 11, 2004. Mr. Sonterre indicated that 3M was submitting the discharge information to the city. He was not aware of any issues or concerns.

Mr. Todd Fasking, Senior Environmental Engineer with 3M, was interviewed on February 19, 2004. Mr. Fasking indicated it was 3M's opinion the ground water containment system was functioning as intended and was protective of human health and the environment. He further stated the remedy was effective at removing VOCs and for providing plume containment and contraction. He was not aware of any issues or concerns.

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The July 26, 1983 AOC and Consent Order documented the remedial action for the Oakdale Disposal Sites. The remedial action included the identification and removal of buried wastes and contaminated soil, the proper abandonment of multi-aquifer wells, the construction and operation of a ground water containment system, and establishment of a long-term ground water monitoring network.

The identification and removal of buried wastes and contaminated soil was completed in 1983 and 1984. Thirty-nine privately owned wells were abandoned during 1984. The ground water containment system was placed into operation during August 1985 and continues to the present.

The criteria listed in the AOC states in Section 7.02 of the RAP that "the objective of a shallow groundwater pumpout system would be to remove and contain highly contaminated shallow groundwater beneath the disposal sites, thus preventing its movement laterally and into the deeper aquifer." This clearly establishes the objective of the remedial action as a containment system, not an aquifer restoration.

The ground water containment remedy continues to remove VOCs from the aquifers and has resulted in stable to decreasing contaminant concentrations since the remedy was implemented. The contaminant plume is not migrating and is decreasing in lateral and vertical extent. There are no known drinking water wells which are currently impacted by the contaminant plume.

The system has been in operation for over 19 years. There do not appear to be operation and maintenance issues that have adversely affected the ground water extraction and treatment system.

The MPCA is currently working with 3M to establish institutional controls in the form of a restrictive covenant for both soil and ground water contamination which remains on site. Once the institutional controls are finalized, the operational and administrative tasks will be complete to ensure the effectiveness of the remedial action.

Once the institutional controls are in place, the MPCA will proceed with deletion of the site from the Minnesota Permanent List of Priorities (PLP). The MPCA has also requested that EPA evaluate the site for deletion from the NPL based on the criteria that the response actions have been implemented and the remedy is a ground water containment system with long-term operation and monitoring.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

ARARs associated with the construction and long-term maintenance and monitoring of the RA at the Oakdale Disposal Sites were not addressed in the Consent Order. However, the MCLs, HRLs and HBVs have been used as performance standards to evaluate the effectiveness of the ground water containment system to control plume migration and stability.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy.

VIII. ISSUES

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The institutional controls are not in place.	N	Y

IX. RECOMMENDATIONS

The ground water containment remedy is removing VOCs from the aquifers and has resulted in a stable to decreasing contaminant plume. It is recommended that the ground water remedy continue as appropriate based on the findings of the annual review. The Consent Order establishes a legal agreement with 3M to continue the long-term operation and maintenance of the remedial action ensuring neither State nor Federal dollars will be needed to complete operation of the remedy. The site is being evaluated for delisting

from the PLP and the NPL based on implementation of the institutional controls and continued success of the ground water containment system. The following recommendations are:

- Finalize the institutional controls which will consist of a restrictive covenant. 3M has submitted a draft restrictive covenant for MPCA review and will record the final document with Washington County once it is approved by MPCA.
- Continue to operate, maintain and monitor the ground water containment system to the extent necessary to maintain protectiveness of human health and the environment. The effectiveness of the ground water containment system should continue to be evaluated on an annual basis in the AMR with the intent of revising the system as needed.
- Recommend to EPA that the Site be deleted from the NPL once institutional controls are put in place.

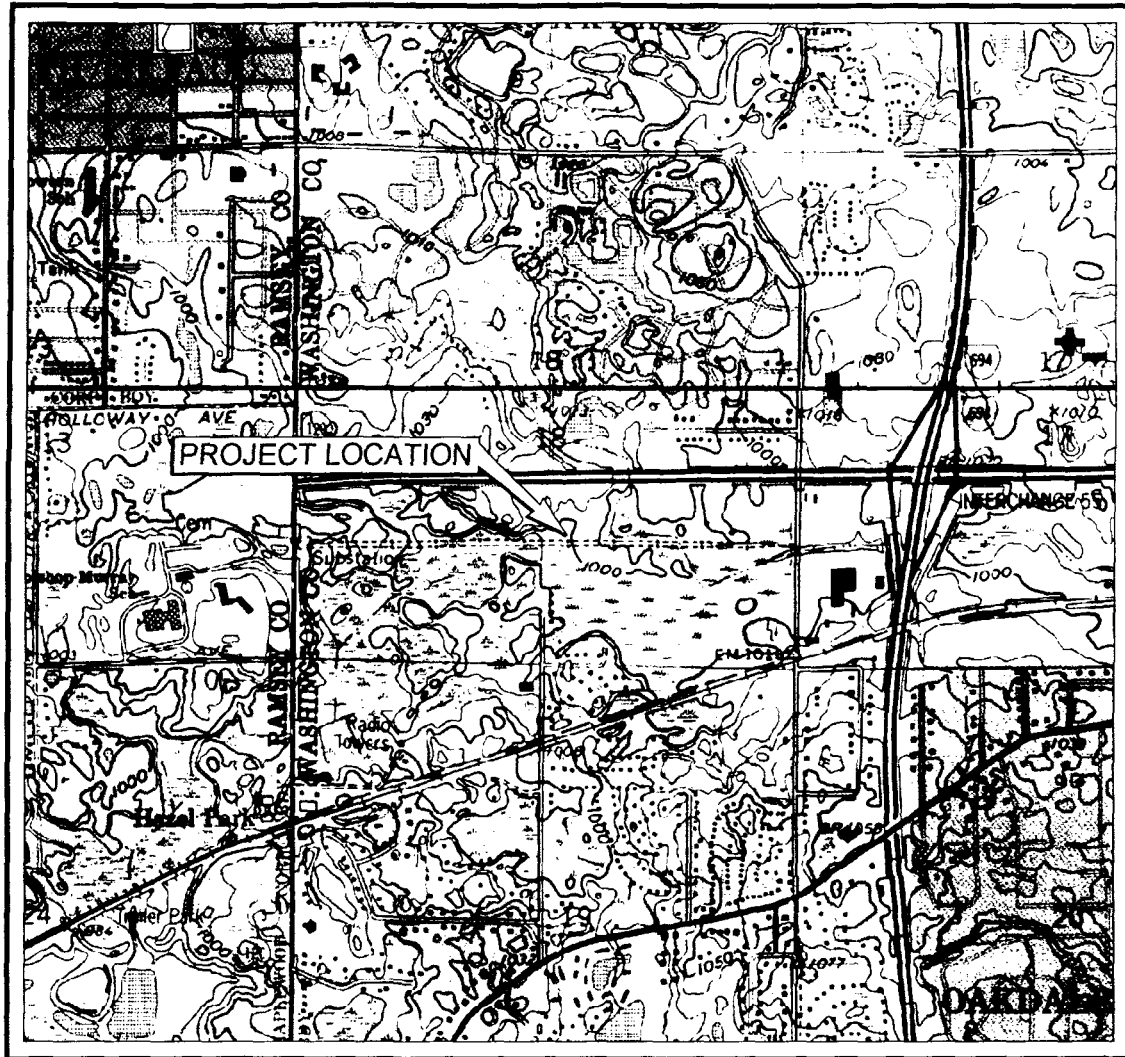
X. PROTECTIVENESS STATEMENT

The ground water containment remedy is controlling plume migration both laterally and vertically. The remedy is functioning as intended and is protective of human health and the environment in the short term. Long term protectiveness will be ensured once the institutional controls are in place.

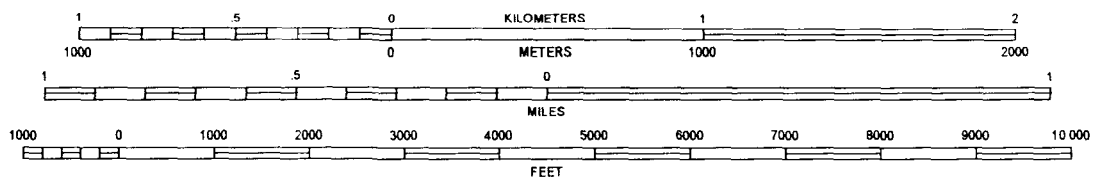
XI. NEXT REVIEW

Hazardous substances, pollutants, or contaminants will remain at the Oakdale Disposal Sites that will not allow for unlimited use or unrestricted exposure. EPA or the MPCA, if delegated to do so by EPA, will conduct another Five-Year Review by May 18, 2009.

APPENDIX A



SCALE 1:24 000



LAKE ELMO QUADRANGLE
MINNESOTA - WASHINGTON COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)



DIAGRAM IS FOR GENERAL LOCATION ONLY.
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SITE LOCATION MAP
OAKDALE DISPOSAL SITES
HIGHWAY 5
OAKDALE, MN
MPCA




Project Mgr:	WJB	Terracon 3535 Hoffman Road East White Bear Lake, MN 55110	Project No.	41047001
Designed By:	WJB		Scale:	AS SHOWN
Checked By:	WJB		Date:	2/17/04
Approved By:	WJB		Drawn By:	CDR (41)
File Name:	41047001sl.dwg	TOPO	Figure No.	1



Figure 3

MONITORING WELL LOCATIONS
Oakdale Disposal Site
Oakdale, Minnesota

LEGEND

-  Platteville Well
-  St. Peter Well
- Plume of Isocropyl Ether in Platteville
-  Abresch Site Detail

LEGEND

- Basal Alluvium Well
 ▲ Plateville Well
 ● Pump-out Well
 ◆ Base of Surficial Well
 ○ Water Table Well
 ⊠ Abandoned Well
 □ Inferred Limits of Abresch Disposal Site Area

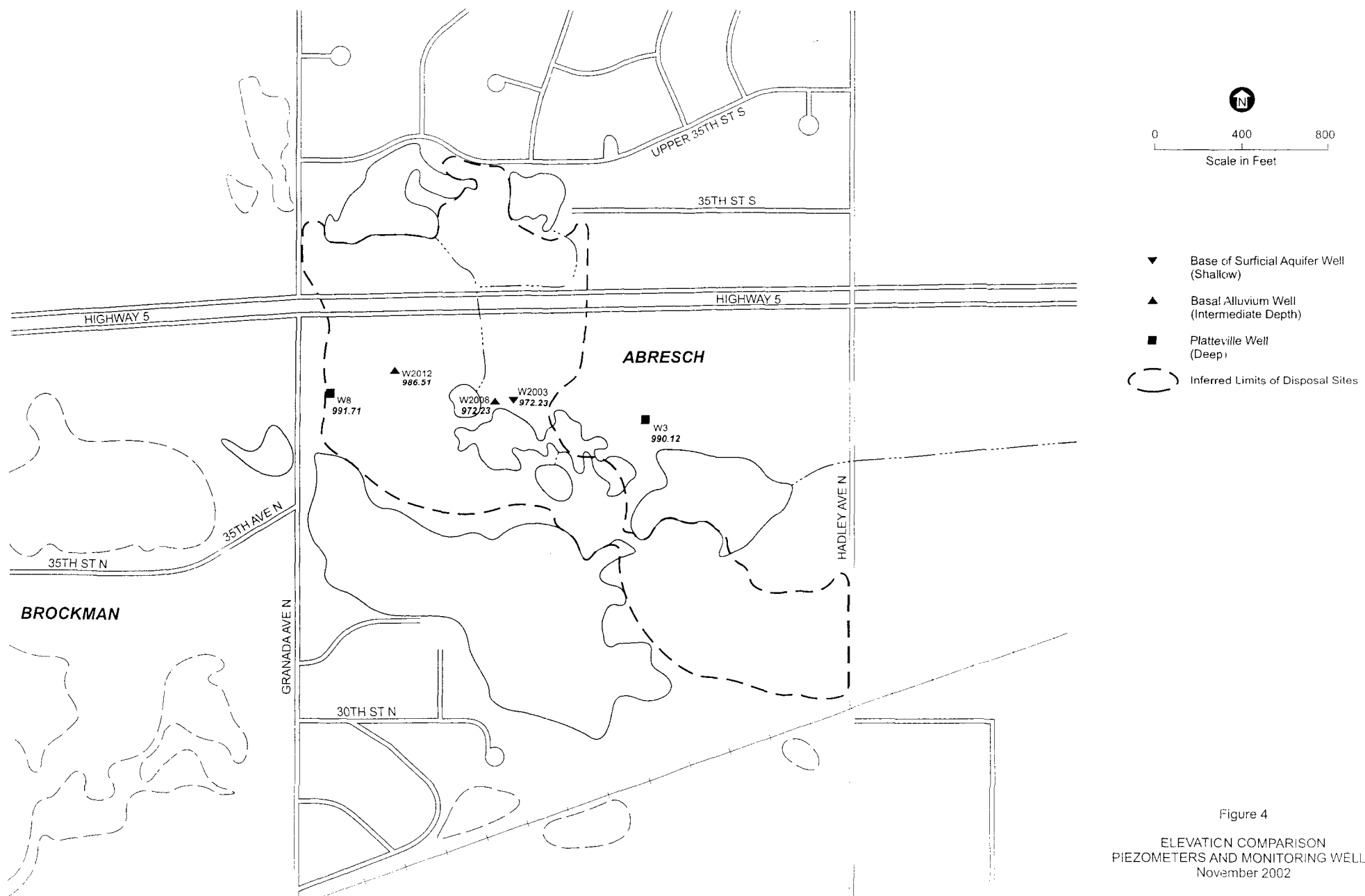


Figure 4
ELEVATION COMPARISON
PIEZOMETERS AND MONITORING WELLS
November 2002

APPENDIX B

Table 1
Pumpout Well Operating Data
Abresch Pumpout Wells

Pumpout Well No.	Total gallons of Water Pumped		Average Operational Pumping Rate ¹ (GPM)		VOC Concentrations (ug/L)				Estimated Total Gallons of Volatile Organics Pumped ²		Total mass Removed (kg)	
	2001 ³	2002 ³	2001	2002	2001 1st half	2001 2nd half	2002 1st half	2002 2nd half	2001	2002	2001	2002
PW1	289295	309010	0.6	0.6	28000	29000	31000	35000	10.3	13	31	40
PW2	4611920	5167560	8.6	10.4	27000	61000	40000	76000	260	362	789	1097
PW3	221190	232155	0.4	0.4	1000000	950000	850000	1100000	270	288	818	874
PW4	3500690	3252765	6.6	6.3	23000	45000	33000	30000	150	128	455	388
PW5	5595	2010	0.01	0.004	300000	635000	62000	30000	2.5	0.1	8	0.3
PW6	6590335	6962040	12.3	13.4	7300	3700	4000	3500	45	33	135	100
PW7	4134080	4165845	7.7	8.0	1900	938	730	670	7.2	3.6	22	11
PW8	478315	470775	0.9	0.8	5100	9800	2500	8600	4.5	4.5	14	14
PW9	335535	310385	0.7	0.6	440	1400	200	510	0.4	0.1	1	0.4
PW10	19850	21145	0.04	0.0	11000	26000	16000	17000	0.4	0.4	1	1.3
PW11	3802750	3481790	7.1	6.7	8900	4100	3400	4800	31	18	93	54
PW12	0	0	0	0	0	0	0	0	0	0	0	0
Total	23989555	24375480	45.0	47.3					780.7	850.6	2367	2579.0

1 Average pumping rate was determined based on the operating period for each well.

2 Total gallons of volatile organic compounds are calculated as (discharge from Jan thru June * 1st half VOC concentration) plus (discharge from July thru December * 2nd half VOC Concentration)

3 Rates for 2001 based on the period 1/6/01 to 1/10/02. Rates for 2002 based on the period 01/10/02 to 12/31/02.

Table 2
Ground Water Analytical Data - Monitoring Wells
Oakdale Disposal Sites
Oakdale, Minnesota

		Total VOC Concentration		Isopropyl Ether Concentration	
Well Number	Aquifer	Highest Documented Concentration	Last Sample in 2002	Highest Documented Concentration	Last Sample in 2002
Wells North of Highway 5					
W20	Upper Alluvium	49,000	24,000	17,000	4,600
W21	Upper Alluvium	100,000	910	22,000	740
W22	Upper Alluvium	110,000	3,800	97,000	3,700
W24	Upper Alluvium	220,000	170	9,800	170
W26	Upper Alluvium	300,000	2,300	20,000	120
W2007	Basal Alluvium	2,400	120	2,300	120
Wells in the Main Pumpout Area					
W23	Upper Alluvium	5,800	ND	30	<5
W25	Upper Alluvium	360	ND	280	<5
W28	Upper Alluvium	3,500	ND	210	<5
W29	Upper Alluvium	380,000	39,000	90,000	14,000
W30	Upper Alluvium	DRY	DRY	DRY	DRY
W31	Upper Alluvium	2,200	ND	2,000	<5
W32	Upper Alluvium	16,000	6,400	14,000	4,500
W36	Upper Alluvium	37,000	2,100	11,000	1,500
W215	Upper Alluvium	2	ND	2	<5
W2001	Basal Alluvium	22,000	210	610	93
W2003	Basal Alluvium	450	69	450	69
W2005	Basal Alluvium	6,100	440	6,100	440
W2006	Basal Alluvium	3,100	ND	3,000	<5
W2008	Basal Alluvium	250	39	250	39
W2010	Basal Alluvium	2	ND	<5	<5
W2012	Basal Alluvium	11,000	580	10,000	570
Wells in Isthmus					
W33	Upper Alluvium	18,000	12,000	16,000	6,600
W2009	Basal Alluvium	450,000	75	15,000	75
Wells in Southeast Area					
W35	Upper Alluvium	44,000	ND	2,700	<10
W205	Upper Alluvium	2,400	1,000	2,400	1,000
Wells Southwest of Abresch Site					
W481	Plattville Formation	ND	ND	ND	<5
W6101	Plattville Formation	2	ND	ND	<5
W6102	Plattville Formation	440	20	440	20
W6104	Plattville Formation	700	13	700	13
W6105	Plattville Formation	16	ND	6	<5

Table 2
Ground Water Analytical Data - Monitoring Wells
Oakdale Disposal Sites
Oakdale, Minnesota

		Total VOC Concentration		Isopropyl Ether Concentration	
Well Number	Aquifer	Highest Documented Concentration	Last Sample in 2002	Highest Documented Concentration	Last Sample in 2002
<i>Wells on or near Abresch Site</i>					
W1	Plattville Formation	17	ND	ND	<5
W3	Plattville Formation	1,900	800	1,800	720
W8	Plattville Formation	110	29	100	29
<i>Wells Northeast of Abresch Site</i>					
W80	Plattville Formation	30,000	ND	18,000	<5
W1103	Plattville Formation	2	ND	2	<5
W6201	St. Peter Sandstone	750	ND	740	<5

Notes:

VOC - Volatile organic compounds

< - means "less than"

ND - Not detected. There are either multiple VOCs with differing reporting levels or for IPE the reporting level has varied over the years.

The highest documented concentration is based on the highest concentration listed in the 2002 AMR data tables

N:\04\04_7001\Final 5-Year Review Doc\Table 2.xls

04/02/04

APPENDIX C

BIBLIOGRAPHY

- July 23, 1983, Administrative Order by Consent and Response Order by Consent
- Five-Year Review Report, Oakdale Disposal Sites, Oakdale, Minnesota, March 31, 1993
- Five-Year Review Report, Oakdale Disposal Sites, Oakdale, Minnesota, March 27, 1998
- 1997 Annual Monitoring Report, Oakdale Disposal Site, April 1998, Barr
- 1998 Annual Monitoring Report, Oakdale Disposal Sites, May 1999, Barr
- July 1, 1999, Letter from MPCA with comments regarding the 1998 Annual Monitoring Report
- 1999 Annual Monitoring Report, Oakdale Disposal Sites, April 2000, Barr
- June 5, 2000, Letter From MPCA with comments regarding the 1999 Annual Monitoring Report
- 2000 Annual Monitoring Report, Oakdale Disposal Sites, April 2001, Barr
- May 14, 2001, Response to Request for Health Based Value memo from MDH
- Soil Gas Evaluation, 3M Facility, Oakdale, Minnesota, May 2001, Environmental Resource Group, LLC
- July 26, 2001, Letter from MPCA commenting on the Soil Gas Evaluation Report dated May 2001
- Supplemental Report, Soil Gas Evaluation, 3M Facility, Oakdale, Minnesota, September 2001, Environmental Resource Group, LLC
- October 9, 2001, Letter from 3M commenting on the MPCA letter dated July 26, 2001
- 2001 Annual Monitoring Report, Oakdale Disposal Sites, April 2002, Barr
- May 24, 2002, Letter from MPCA with comments regarding the 2001 Annual Monitoring Report
- July 2, 2002, Letter from MPCA regarding the Soil Gas Evaluation Reports
- Quality Assurance Project Plan, 3M Oakdale Disposal Sites, Oakdale, Minnesota, November 2002

3M Oakdale Pump Out Report, Various Dates From 1998 Through 2002, Bay West, Inc.

Abresch Disposal Sites Special Discharge Report, Permit No. 2021, Various Dates From 1998 Through 2002, 3M

2002 Annual Monitoring Report, Oakdale Disposal Sites, March 2003, Barr

Quality Assurance Project Plan, 3M Oakdale Disposal Sites, Oakdale, Minnesota, May 2003 Revision 1.0